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MINNESOTA

DEPARTMENT OF COMMERCE

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EMERALDS

BY

IRENE AITKENS

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

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By Irene Aitkens[2]

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INTRODUCTION

The emerald is the most costly of all gems, due to the scarcity of flawless stones. This fact gave rise to the ancient axiom, "As rare as an emerald without a flaw."

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The finer gems not only command the highest prices at all times, but when flawless are considered the most highly prized of all gem stones. Dr. George F. Kunz divides emeralds into two distinct classes: "Exceptional specimens," which bring as much as $6,000 a carat; and "fine-quality specimens," which bring about $1,000 a carat.

DESCRIPTION AND PROPERTIES

Precious emerald is a variety of beryl. The emerald which comes from corundum is called "Oriental emerald," and is also green and transparent but is adamantine when cut. Although the emerald of the beryl mineral is a beryllium-aluminum silicate, $Be_3Al_2(SiO_3)_6$, the Oriental emerald or corundum mineral, consists essentially of aluminum oxide, Al_2O_3.

The hardness of beryl on Moh's scale varies from 7½ to 8, or is a little higher than that of quartz. It is very brittle, however, and can be easily fractured; the specific gravity is 2.69 to 2.79. The Oriental emerald is much harder, 9 on the Moh's scale, and heavier (specific gravity, 3.95 to 4.11).

When pure, beryl is colorless, but it is rarely if ever free from a tinge of blue or green. The color is usually green, grass-green, or yellowish green, but it is sometimes yellow, pink, and rose-red. The peculiar color of emerald is supposed to be caused by chromic oxide, small quantities of which have been detected in it by chemical analysis. Emerald loses water on being heated but retains its color unimpaired; the color therefore can not be due to organic matter as has been suggested by Lewy.[3]

Natural crystals of beryl have the form of a six-sided prism, and in the case of the emerald they invariably, if whole, end in a single face at right angles to the length of the prism.[4] The term "aquamarine" is applied to the sea-green and blue-green stones, and the term "beryl" is restricted to the paler shades and other colors. Aquamarines have a number of small inclined faces, and stones are found that taper, but this effect is due to corrosion. Morganite is a trade name now used to distinguish the beautiful rose beryl. The varying shades of aquamarines are due to the influence of the alkaline earths, whereas the rose color of morganite is no doubt caused by lithia. Helidor, the yellow beryl, is a variety from Southwest Africa. This also owes its color to the minute content of one or more of the alkaline earth metals. Goshenite is a very pure colorless variety of beryl found near Goshen, Mass. Davidsonite is a greenish yellow beryl from near Aberdeen, Scotland.

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3 Lewy, M. B., Recherches sur la formation et la composition des Emerandes: Ann. Chim. Phys., vol. 53, 1858, p. 5.

4 Smith, G. F. Herbert, Gem Stones: London, 1912, p. 186.

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In the jewelry business names given to gem stones are largely based upon the color. From a standpoint of accurate determination, the color may be the least reliable of all the different and essential physical characteristics of a gem stone.

Then, too, qualifying terms are used to distinguish the stones of obviously different hardnesses. For instance, "Oriental" distinguishes varieties of corundum but does not necessarily imply that such stones came from the Orient. "Oriental emerald" is a green corundum material and not an emerald at all. "Brazilian emerald"[5] is chiefly a tourmaline rich in alkalies, which give it transparency and attractive coloring. "Uralian emerald" is an emerald-green andradite, from the Ural Mountains.

Due to erroneous nomenclature one would infer that there are numerous kinds of emeralds to be purchased. However, although many green stones are substituted for emeralds and serve the same purpose, there is none that approaches the genuine emerald in beauty or value. Since the name of a gem stone is of paramount importance for its success or failure, jewelers and merchants have used these many terms to put certain stones on the market. These names serve a business purpose but do not in any way indicate that such stones are acceptable substitutes for the real stone.

IDENTIFICATION

The true emerald is so characterized by its fine green color and by the variations in specific gravity and hardness compared with other green stones, that its determination is not considered difficult. Stones of similar color, such as "Oriental emerald" (the corundum mineral), hiddenite, and alexandrite, can be readily distinguished from emerald. Their specific gravity and hardnesses are as follows:

	Specific gravity	Hardness
Emerald	2.67	7½
Hiddenite	3.17 - 3.19	7½
Alexandrite	3.68 - 3.78	8½
"Oriental emerald"	3.9 - 4.1	9

In addition to color, hardness, and specific gravity, an expert mineralogist readily recognizes other external characteristics, such as transparency and luster. All of these characteristics are observable with the naked eye, or at least with a common lens.

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5 Kraus, Edw. H., and Holden, Edw. F., Gem and Gem Materials: New York, 1925, pp. 121, 131, 134.

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Obviously, only such methods of determination should be adopted as would not injure the stone, especially after the stone has been cut; the avoidance of even small surface injuries is of paramount importance. Since in many cases an absolute determination would involve injury to a mounted stone, gems for which large sums are asked are purchased unmounted.

The difference in the value of a perfect and an imperfect emerald is exceptionally great because compared with other precious stones, perfect specimens of emeralds are extremely rare. Fissures are almost invariably present and irregularities in the distribution of color and dull and cloudy patches are found in many of the stones. This cloudiness and dullness is caused either by fissures or by microscopic enclosures of fluid or solid impurities. Flakes of mica are found in some stones, especially those from the Transvaal. Even imperfect stones, however, have a certain high value if they possess a fine emerald-green color.

SUBSTITUTES

The high price commanded by emeralds, and the comparative success that attended the reconstruction of the ruby by remelting fragments of natural stones, suggested that equal success might follow from a similar process with powdered beryl; but the resulting stones were only a fair imitation. Chromic oxide was used for the coloring agent, but the result was merely a beryl glass with lower specific gravity and refractivity than the true beryl. Such stones, as well as others composed merely of green paste (lead glass), have been marketed as "scientific" emeralds. These imitations are readily detected, since an ordinary steel needle will scratch the paste or "strasse" but has no effect on the emerald.

The most successful imitations are produced by mechanical means and by using fragments of true emerald crystals. Such manufactured imitations are usually in one of three forms: (1) Doublets (true and false); (2) triplets; and (3) those produced by fitting together scrap and slivers. In the third type the fragments may be held together with a suitable adhesive paste or may be fused together; if fused, however, air bubbles are formed in the interior of the stone.

A true doublet consists of two sections, each of genuine material, joined with an invisible cement to produce a larger stone, the value of which would naturally be greater than the sum of the values of the two smaller pieces. The layer of cement in these doublets may be detected by immersing the stone in a liquid with an index of refraction approximately equal to that of the gem fragments. The cement is frequently soluble in alcohol or chloroform; so when a doublet is soaked in one of these liquids the two portions may fall apart. The two pieces are generally cemented together so that when cut and polished the joint is formed at the girdle.

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The false doublet has a genuine crown, while the pavilion ordinarily consists of colored glass or of an inferior stone. The exposed portion, being genuine, would stand successfully the usual tests that might be made upon it. However, a false doublet of emerald may also be made with a less expensive green stone for the crown cemented to the lower portion of green glass, no natural emerald whatever being used. In false doublets the joint is not necessarily at the girdle.

The character of these false doublets may be detected by the methods applied in the case of true doublets, or one may breathe upon the stone, causing a film of moisture to be formed. This permits the boundary between the two portions to be more easily seen. If the two portions of the doublet are differently colored, the character of the stones may be ascertained by holding it over a white background.

There are two other types of false doublets which now, however, are of little importance, as they are infrequently used. The first consists of an upper portion of quartz to withstand wear and a lower portion of glass, separated by a thin plate of colored mineral. In the other, the hollow doublet, the lower side of the crown is hollowed out and a colored liquid is placed within this cavity in order to impart the desired color to the stone.

Closely related to the doublets are triplets. The triplet has been used considerably more to imitate the emerald than has the doublet. A layer of green glass, usually of the type known as paste, is cemented between two thicker layers of beryl. The beryl gives the stone the proper hardness, while the glass contributes the green color. The upper section of beryl is of sufficient thickness to extend below the girdle, whereby the effectiveness of the deception is greatly increased.

In the third type the reconstructed stone generally consists of emerald only. The finished cut stone may be made up of two or more pieces, but the value of the stone decreases with the number of pieces used. Some emeralds of small size may be perfectly clear and flawless in one end. This end is cut off, and if it is too small to form a cut gem alone, it is cemented to one or more similar pieces. Large stones may be made in this manner, and being composed wholly of real emerald they bring much higher prices than either doublets or triplets.

HISTORY

Emeralds have been prized for many generations and in ancient times they apparently came from Egypt, from the so-called Cleopatra emerald mines. During the middle ages these deposits were completely lost and it was not until the beginning of the eighteenth century that they were rediscovered by Cailland, who had been sent by the Viceroy of Egypt to search for them.

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In Egypt there are still abundant evidences of emerald mining in ancient times; the hillsides are honey-combed with mining excavations and the ruins of many houses and rock temples. While the age of these workings can not be accurately dated, the most active exploitations were probably in the Greco-Roman period.[6]

In South America the Muzo deposits had long been worked when the Spaniards first set foot in the new world.[7] In 1537 the Spaniards first learned of the existence of these emeralds. The following year, Gonzalo Jimenez de Quesada, the conqueror of the interior of Colombia and the founder of the city of Bogotá, received nine emeralds as a gift from the Indians. Later through two of his captains, he succeeded in locating their source in a wild region about 95 kilometers (70 miles) from Tunja. This locality is now known as the Somondoco or Chivor. The Indians were successful in keeping from their white enemies a knowledge of the exact locations; in fact, for 20 years they hid all traces of the source of these precious stones.

MODE OF OCCURRENCE

Emeralds are found disseminated through dark limestone as in Colombia, in mica and talcose schists as in Russia, or in mica schist of dark color as in the Transvaal, South Africa. Whereas large crystals of common beryl are found almost exclusively in granite pegmatites, this association is often not clearly indicated in the case of precious beryl, or emerald. According to reports made for the Beryl Mining Co., Ltd., the formation of the beryl crystals in the Leysdorp district of the northern Transvaal was found to be identical in character with the Russian beryl and emerald bearing deposits in the Urals, the Egyptian deposits of the Red Sea, and the Austrian formation near Salzburg. In all of these the material is of mica schist, dark in color and composed chiefly of biotite and fuchsite.

Only the deposits at Muzo, Colombia, and Bahia in Brazil vary from the formation described above. In all the Muzo deposits the formation is a dark bituminous limestone and in the Brazilian it is a dark color with numerous sheets of talc in which beryl crystals are embedded.

In Colombia the deposits are found in horizontal layers embedded in fossilized bituminous substance, and when first exposed to the air are relatively soft. These deposits, however, are thought to have been metamorphosed by solutions from pegmatite intrusions.[8]

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6 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1923, p. 578.

7 Pogue, Joseph E., The Emerald Deposits of Muzo, Colombia: Trans. Am. Inst. Min. Eng., May, 1916, vol. 55, pp. 910-934.

8 Pan American Union Bulletin, The Emerald Mines of Colombia: Washington, D. C., June, 1914, p. 843.

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At Muzo, according to Pogue, the most important deposit in Colombia, the minerals occur in calcite veins traversing black carboniferous limestone, in which are found ammonites and other fossil remains, placing the age of the deposit as Lower Cretaceous.

The calcite veins run through the limetone in all directions and at all angles. There is no well-defined dip or strike. In some parts of the deposits where for certain reasons, a mass of the formation has been left standing with clean and perpendicular escarpment, the calcite veins show a more or less horizontal "lie." There is, however, no rule to go upon in describing the behavior of the veins, which vary in width from a mere streak of less than 1 inch up to 18 to 20 inches, but these wider veins are not as rich as the narrow ones. The best stones are found in the veins 6 inches or less in width.

Emeralds are found in calcite or as separate crystals. They are also found embedded in the formation with or without an envelope of calcite matrix. Usually the crystals are very much broken in the process of mining and are recovered in fragments. This does not mean that the emeralds were broken by the tools used to extract them from the matrix, but that the fractures were probably due to contortion and disturbance, since the crystals were found "in situ."

In the Transvaal, Union of South Africa, the emerald-bearing deposits are similar to those at Takovaya, in the Ural Mountains; also the Egyptian deposits and the Austrian. According to a report by Captain Reeves-Moore;[9]

> The material carrying the beryl crystals is mica schist of extremely dark color, and is composed chiefly of biotite and fuchsite. The main occurrence is a lenticular mass, about 500 feet long by 200 feet wide. The cleavage of the schist is diagonally across the deposit, and there is considerable differentiation of the material, in alternating zones running parallel to the lines of cleavage. In a number of these zones of differentiation the mica flakes are of much larger size. Judging from the much greater size of the weathered and bleached crystals, occurring thickly in these larger flake mica zones, the conditions prevailing in them seem to have been especially favorable to the crystallization of the beryl emerald constituents of the magma.

In Austria[10] the emerald-bearing strata are defined on one side by a highly hornblende schist and a massive, well-marked gneiss formation on the other, while in some parts between these formations large crops of serpentinous and other magnesian rocks are observable; consequently the general geological make-up of this valley is characteristic of the Muzo mines of Colombia.

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9 Reeves-Moore, , Emerald Discovery in the Transvaal: South African Min. and Eng. Jour., Nov. 26, 1927, pp. 329-331.

10 U. S. Geol. Survey, Mineral Resources of the United States, Calendar Year 1906: 1907, Pt. II, p. 1215.

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The emeralds found in Maine and Connecticut were associated with pegmatites, whereas those at the emerald-hiddenite mines in Alexander County, N. C., were found in pockets and cavities in veins cutting biotite gneiss. There are numerous veins near the mine which carry common beryl, aquamarine, and quartz, but emeralds and hiddenite were found only in a few veins.

In Mitchell County, N. C., the emeralds occur in pegmatite inclosed in mica gneiss. A body of hornblende gneiss was found a few feet east of this vein. Occasionally gems of value have been found. Some crystals of emerald are abundant, the color being a good emerald-green. Much of the pegmatite matrix contains white felspar, gray quartz, black tourmaline, and green emeralds.

The occurrences at the Turner mine in Cleveland County, N. C., are similar in many respects, but here there are certain associated rocks which seem to belong naturally with the occurrence of emerald that are not present in other deposits. Here the emeralds occur in pegmatite cutting hornblende hypersthenite. The common constituents of these rocks are pale green hornblende, light-brownish hypersthene, olivine, augite, biotite, pleonaste, magnetite, and a little pyrite and pyrrhotite. Though very few true emeralds have been found, the similarity in the association of minerals and of inclosing rocks in the other pegmatites has been considered promising.

MINING AND PREPARATION

Both underground and open-cut or quarry methods are used in the mining of emeralds.

In Colombia,[11] mining is done exclusively by open-cut methods. Pogue describes mining methods of the Muzo Mines as follows:

> The steep slopes of the emerald formation, stripped of their covering of jungle, are worked in great terraced banks (bancos), affording benches on which lines of peons stand and attack the bench below with long iron crowbars. The comparatively soft limestone and shale are easily broken away in this way without recourse to blasting (which would shatter the fragile emerald crystals), and the emerald-bearing calcite veins are carefully removed by hand and taken to a sorting shed above. The débris falls down the step-like slope and the accumulation at intervals is swept down to the creek below by water led from reservoirs in the mountains above the workings.
>
> In the sorting shed the calcite veins are carefully broken by hand and the emerald crystals picked out. The finer material, together with the gem-bearing débris gathered from "bed-rock" and

11 Pogue, Joseph E., The Emerald Deposits of Muzo, Colombia: Trans. Am. Inst. Min. Eng., 1916, vol. 55, pp. 931-932.

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from the water channels below the banks, is washed on sloping tables and the emerald fragments withdrawn by boys. The stones are separated into a number of grades according to color, size, transparency, and freedom from flaws. The product goes by mule to Bogotá, from time to time, and there awaits transportation to London in larger consignments.

The labor is done by Indian peons drawn from the neighborhood. Mining officials and police are supplied from Bogotá or other towns. Great vigilance is exercised when the mines are in operation, to reduce loss by theft. A body of military police is assigned to the mines, the exits are carefully guarded; watchmen are always on duty in small guard houses on prominent points above the workings; overseers are in constant attendance during hours of work; and the workmen are impounded and not allowed to leave the mines until the culmination of a suitable period of search.

The mining equipment is simple, but the fragility of the emerald precludes the use of most types of equipment that would increase the quantity of ground handled.

According to Rainier,[12] the methods employed at the Chivor-Somondoco mines are essentially similar. The work starts from a trench dug at right angles to any veins that may lie below the surface, and the loosened dirt is washed away by a head of water released from a reservoir or "tambre" having a large gate that permits it to be emptied in less than a minute. The sides of this trench are cut down in steps as described in connection with the Muzo operations and when the sides reach an angle of 45° the bottom is deepened by another rush of water. This method, it will be seen is not greatly different from the "booming" methods employed in placer mining in certain of our western States, but in Columbia considerable rock is removed by blasting. Apart from the drilling, the only tools used are crowbars and hoes.

As an instance of the extent to which these operations are conducted, a recent crosscut executed in this manner was 400 feet long, 120 feet deep, and involved the removal of approximately 200,000 cubic yards of material. Of this material a fair proportion was rock in which about 4,000 linear feet of hole was drilled and 1,000 pounds of 90 per cent gelignite was used. In drilling emerald formation great care is necessary in the placing of holes in relation to emerald veins to avoid breakage of the gem crystals. The cost of the operation described, including rock drilling and explosives, was slightly under 10 centavos per cubic yard.

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12 Rainier, P. W., The Chivor-Somondoco Emerald Mines of Colombia: Am. Inst. Min. and Met. Eng., Tech. Pub. 258, Feb., 1930, p. 8.

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The men work in gangs of from 15 to 40. Each gang is handled by an Indian foreman, and close supervision is maintained by responsible members of the staff. When emerald formation is reached, distinguished by firm to hard rock with well-defined veins, a close watch is kept for a showing of morralla, or emerald mineral. This is immediately reported to the company official supervising the work and he closely watches the development of the vein. The emeralds are picked by hand from the vein, cleaned with acid, graded, and prepared for shipment.

Under the Colombian mining law, it is illegal to transport rough or uncut emeralds in the country except under Government seal; therefore, when sufficient production has accumulated at the mine to make a shipment, a Government inspector is sent for to Bogotá. This official weighs and seals the production, which is then taken to Bogotá. The production must be delivered in the Government offices with seals intact, the seals are here broken, the emeralds reweighed and appraised by the Government appraiser and resealed. This accomplished, an export permit is obtained and shipment abroad is made under seal.

Grading of Emeralds

The emeralds are sorted into a variety of grades, according to color, transparency, size, freedom from fissures or enclosed impurities, and various other considerations, before they are ready for the market. The final sorting, however, is done upon arrival at the sorting sheds. Not until the treatment of the emerald matrix has been accomplished is this final sorting for the market done. According to Charles Olden[13] this valuable matrix is dealt with as follows:

The larger pieces are broken up by light hammers, and the resulting product is again reduced in size. Each piece is examined very closely for gems or emerald colorations, and the waste sorted out. The final product is reserved and is again broken by light tools. The emeralds which have become loosened are picked out, and if clean are placed into stock while those gems to which matrix still adheres are placed in a bath of cold dilute hydrochloric acid until they are cleaned.

With respect to present-day operations at the Chivor mine, MacFadden says:[14]

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13 Olden, Charles, Emeralds: Their Mode of Occurrence and Methods of Mining and Extraction in Colombia: Trans. Am. Inst. Min. and Met. Eng., vol. 21, 1912, p. 202.

14 MacFadden, C. K., Brief Review of Emerald Mining in Colombia App. 2: Am. Inst. Min. and Met. Eng., Tech. Pub. 258, Feb., 1930, pp. 19-21.

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The emerald material is sorted by an expert immediately after mining, into five classes or grades and morralla, which is a semicrystallized product having much of the appearance of turquoise matrix, but green in color. This material at present is given no commercial value, but has possibilities for use in the manufacture of cuff link settings, and so forth.

No accurate estimate or prediction can be made of the proportions of the several classes in the total mined material. A fairly typical mining return sheet from the Muzo mine covering two months operations (table below) shows percentages of the five principal classes into which the product was divided. The total weight of emeralds recovered was about 10 pounds avoirdupois. The values given are believed to be considerably higher than are at present used by the Government appraisers in estimating the value of the rough material.

Two Months Mining at Muzo Mine

Classes	Weight (carats)	Value 1/	Per cent of total weight	Per cent of value
No. 1 2/	523	$ 130,750	0.75	7.70
No. 2 2/	2,182	218,500	3.15	12.80
No. 3	9,548	477,400	13.80	28.80
No. 4	12,849	316,200	18.50	18.50
No. 5	44,116	551,400	64.00	32.40
	69,018	1,694,250	100.00	100.00

(Average per month, 34,509 cts. = $847,125 as operated by English mining company)

1/ Estimated values based on one carat (3 1/5 grains): No. 1 grade, $250; No. 2, $100; No. 3, $50; No. 4, $25; No. 5, $12.50.

2/ It will be noted that the No. 1 and 2 grades, having a total weight of less than 4 per cent of the output, yield more than 20 per cent of total value.

It will be noted immediately that notwithstanding the very high value placed on the No. 1 grade, the total value of this mined during these particular two months represents less than 8 per cent of the total values, whereas the No. 5 quality, valued at one-twentieth the price per carat, yields nearly one-third of the total value of the two months mining.

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It is interesting to note that even during a period when veins containing emeralds of fine color are regularly producing, an almost infinitesimal portion of the total product would grade as superfine gems, the proportion being something like 0.01 per cent. The exact percentages can only be ascertained after the stones have been cut by a skillful lapidary.

The mining manager of the British company which some years ago operated the Muzo mine on special contract with the Colombian Government is authority for the statement that once, after a long period of poor returns, one of the veins "commenced to produce;" a pocket or "nest" of high-grade crystals was encountered and from a few cubic yards of vein material, $400,000 in fine emeralds was obtained in a few hours. Such instances, although rare, are the incentives which urge the mining engineer familiar with gem mining to unravel the geological snarl which at present marks the genesis and deposition of the Colombian emeralds.

In Austria,[15] mining of emeralds was carried on by deep mining. The emerald-bearing matrix was reached by four levels driven into the deep declivity of the mountain, varying in depth from 600 to 700 feet below the top of the divide or pass of the two mountains constituting the great Legback Valley. Peasants were used in the mines and the work was carried on by primitive methods. The matrix was carried to the mouth of the levels in baskets and then lowered to the valley below, where the sorting was done by women and young boys. At no time were the operations carried into the heart of the mountains.

WORLD PRODUCTION

At present Colombia, South Africa, and Russia are the chief producers of emeralds. The production of the other countries is small and varies from time to time.

Production data are meager, but the aggregate output of new stones in most years amounts to $500,000 or more in the rough state. During 1925, the output of the State-controlled Muzo mines in Colombia alone was valued at $250,000.[16] The Colombia Emerald Development Corporation reported a 1928 production of 22,712 carats from the Chivor mine, near Somondoco; but no information was available on the operation or output of the State-controlled deposits at Muzo and Cosquez. According to Kunz,[17] the leasehold of the Government-owned mines was to be sold at auction in September, 1930.

15 U. S. Geological Survey, Mineral Resources of the United States, Calendar Year 1906: 1907, Pt. II, p. 1215.

16 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1926, p. 585.

17 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1929, p. 548.

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In South Africa, the Somerset mine[18] of the Beryl Mining Co., was treating about 50 tons of rock per day (or 1,200 tons per month). The rock yielded by the end of 1928 1¼ pounds of crystals per ton. During 1929 the Beryl Mining Co. put into operation a 200-ton per day plant. In June, 1929, the weekly shipment of sorted crystals going to London averaged 5½ pounds, and sales of cut goods for the month amounted to £915. The year's operation showed a profit of £4,015.

In Russia, production varies from month to month. The stones are excellent, but are surpassed in quality by those from Colombia.

DOMESTIC PRODUCTION

Several localities in the United States have yielded emeralds of good gem quality, but the best specimens have come from North Carolina.[19] Emeralds were first discovered in Alexander County, N. C. about 1875. Several fine gem stones were found on Crabtree Mountain in Mitchell County about 1894. Both of these deposits developed on a fairly large scale and a few fine stones were obtained from each. A third deposit was discovered in North Carolina several years later on the W. B. Turner property about 5 miles from Shelby, in Cleveland County.

Several stones of paler color have been found at Topham and Newry, Me; and at Haddam, Conn.

In the United States the beryl deposits at Golden, Colo., were being exploited as a possible source of beryllium.[20] The deposits at Albany, Me., and Golden, Colo., have not produced any material of gem quality. Until quite recently beryl mining has been carried on solely for the recovery of the emerald; now, however, the metal beryllium is receiving a great deal of attention, and it is believed that within a few years emeralds will be merely a by-product in the recovery of beryllium ores.

IMPORTS INTO THE UNITED STATES

No separate statistics were kept for the imports of emeralds into the United States prior to 1927, the figures being included in "all other gem stones." The imports of emeralds "cut but not set" and "rough or uncut" for 1927-1929, inclusive, were separated from the total imports and were reported as follows:

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18 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1928, p. 532.

19 U. S. Geological Survey, Mineral Resources of the United States, Calendar Year 1911: 1912, Pt. II, p. 1051.

20 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1929, p. 549.

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Imports of emeralds, 1927-1930

	Rough or uncut		Cut but not set	
	Quantity (carats)	Value	Quantity (carats)	Value
1927	2,505	$29,241	14,033	$1,164,028
1928	6,311	51,156	13,830	2,186,336
1929	2,304	17,168	25,433	3,452,585
1930	18,312	72,240	11,234	1,053,694

THE INDUSTRY IN FOREIGN COUNTRIES

Colombia

The Chivor mine is the only emerald deposit being developed in Colombia at present. This field has been operating successfully and on an increasingly large scale since control of it was acquired by the Colombia Emerald Development Corporation.[21]

By contract entered into with the Government in 1909, the Colombian deposits were actively exploited by an English concern, but a few years later this contract was rescinded and the Government reassumed sole control of the mines. Owing to a lack of sufficient capital, operations were totally suspended on January 1, 1913.

The Government regulates production of the mines to maintain a high price level. In April, 1923, the Colombian Government sold the entire accumulated output of the Colombian mines to a firm of French jewelers. As the price of high-quality specimens was then constantly on the increase, some mines held their stocks for a further rise in the market. For some time the output was marketed by this French firm under contract, but in 1928 the contract was terminated by the Government and a policy of direct sales to dealers was inaugurated.

Prior to 1925, Chivor was generally regarded as capable of only low-grade production and was operated on a part-time schedule because of the insufficient water-supply in the dry season. In the four years of development (1925-1930), by the Colombia Emerald Development Corporation, the Chivor mine produced emerals of the higher grades in increasing quantities and has proved up a formation containing high-grade emerald sufficient for many years' operation.

21 Rainier, P. W., Work cited, p. 4.

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Brazil

Emeralds were first found in Brazil near Esmeraldus, in the State of Minas Geraes and near Bom Jesus dos Meiras, State of Bahia, about 1913. Later in 1920 or 1921, what seemed to be a considerable deposit of emeralds was discovered in the northern part of Minas Geraes, near Sao Jose de Gorutuba.

Russia

In 1830, the Russian emerald deposits were discovered on the Asiatic side of the Ural Mountains near the Takowaja River, about 50 miles east of Ekaterinburg. Two years later the mine was regularly worked and remained in operation for about 20 years, at the end of which time it was closed. At the beginning of the twentieth century the deposits were reopened and exploited on a small scale by a French company.

In September, 1923, the Soviet Government confiscated the emerald mines which the French company had operated and awarded a virtual monopoly to the Samozwet Trust, or what is known as the Russian Precious-Stone Trust.

This arrangement apparently was not a success, and in 1927 it was reported that the Soviet Government had withdrawn its concession and granted it to an American firm. It is understood that the mines will be equipped with up-to-date American machinery and that the product will be shipped to Paris by plane.

Austria

Emeralds, many of them fine stones, have been produced at Habachtal in the Province of Saltzburg since the Middle Ages. In 1896 a British company took over the property and worked it in a more or less indifferent manner until, just prior to the World War, a group of peasants of the village of Bramsberg purchased the property. It was reported that on December 1, 1928, the property was advertised for sale at auction. It is thought that the mine has now been worked out.

South Africa

Emeralds were discovered in the Leysdorp district of northern Transvaal in 1927.[22] Some 67 mineral claims were pegged in, but were later acquired by the Beryl Mining Co., Ltd., with the right to purchase prospecting and mineral rights over a great area adjacent to these claims. During this year the African and European Investment Co., and Emeralds, Ltd., were added to the Beryl Mining Co.,[23] who are the original operators in the Leysdorf district of northern Transvaal.

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22 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1927, p. 510.

23 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1928, p. 532.

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Parcels of stones shipped to London were valued at £4 to £20. At this time the market for high-quality material seemed to be undersupplied, and there existed wonderful opportunities for expansion.

New companies formed for operation in the Leysdorp district include Anglo-French Emeralds Co., Ltd., African Emerald Corporation, Ltd., Arundel Emeralds, Ltd., Cobra Emeralds, Ltd., and Standard Emeralds Co., Ltd. In 1929 the African and European Investment Co., Ltd., were preparing to go into active recovery operations; Emeralds, Ltd., was said to have not yet reached the producing stage.

Namaqualand

According to Kunz,[24] beryl has been discovered near Steinkopf, in Namaqualand, and a company has been formed with the primary object of developing the deposit in anticipation of a demand for the beryllium ore. It is thought that minerals of gem quality may be found also.

Australia

Emeralds were discovered near Poona, Western Australia, in 1912, but not until about 1926[25] was anything done toward commercial development. About 4,000 carats of rough stones were mined in 1926, 2,000 carats of which were shipped to London. Among these were eight stones of 20 carats each, and one of 40 carats. As the depth increased, the stones improved in color and value.

The emerald mine at the Glen in Emmaville Division, New South Wales,[26] was reopened during 1908. The majority of these stones are pale in color, but some are of good quality. A stone of 60 carats in the rough was obtained at this time, and the total production of 1,000 carats was said to be valued at over £1,600.

MARKETS AND PRICES

The United States provides the best market for the superfine grades of emeralds, although other grades find a ready sale at satisfactory prices. The material of cheaper quality has always found a better market in the European and Asiatic countries, especially in India, where the lighter-colored stones seem to be in steady demand.

The superfine Colombian emeralds are sold in New York to retail at a price of $3,000 per carat and some extra special gems bring as much as double that amount. However, it is interesting to note that an almost infinitesimal portion of the total product are graded as superfine gems. As noted, the proportion is something like 0.01 per cent.[27]

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24 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1929, p. 549.
25 Kunz, George F., Precious and Semi-Precious Stones: Mineral Ind., 1926, p. 586.
26 U. S. Geological Survey, Mineral Resources of the United States, Calendar Year 1910: 1911, Pt. II, p. 867.
27 Rainier, P. W., Work cited, p. 21.

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